

The Measurement of Tax Elasticity in Sri Lanka : A Time Series Approach¹

Yuthika Indraratna

Since the primary function of a tax system is to generate revenue, the first goal of tax reform must be to ensure that this function is discharged adequately.

World Bank (1991)

Abstract

Revenue mobilisation is an important goal of tax reform. In this regard, tax elasticity - the built-in responsiveness of revenues to changes in income - constitutes an essential ingredient for tax policy formulation. This paper utilises a time series approach to empirically estimate tax elasticities for Sri Lanka for the period 1960-1994. Tax elasticities are computed for income, turnover, excise, import and total taxes on a short run and long run basis for the pre-reform as well as the post-reform periods. All elasticity coefficients reveal a low responsiveness of taxes to income growth with estimates registering less than unity in most cases. The tax buoyancies computed for the same taxes show that tax revenues have been maintained through discretionary measures. (JEL H21, H22)

1. Introduction

A primary motivation for tax reforms in developing countries has been the need for increased revenues. The need to raise more revenue against the backdrop of high expenditures has taken added importance when compared to other sources of resource mobilisation such as deficit financing and money creation. Tax systems have been revamped and restructured with the objective of maximising tax revenues from the reform process. In this regard, tax elasticity - the responsiveness of tax revenues to income at a given rate structure

1/ This paper forms part of a thesis submitted by Y. Indraratna for the Ph.D. degree at the University of London. I would like to take this opportunity to thank Prof. Richard Disney for his guidance and supervision of this paper and Dr. N. Weerasinghe for valuable suggestions.

- constitutes an important ingredient of a tax system. An elastic tax system is one in which tax revenues rise proportionately faster than income as income increases. Such a tax system becomes desirable for developing countries in order to provide resources for government expenditures, both for consumption purposes and for financing capital formation. Apart from the need to mobilise resources for revenue purposes, a study of tax elasticity is also important for revenue forecasting purposes, analysing the automatic stabilising properties of a tax system and for examining the progressivity of a tax system. Therefore, an examination of tax elasticity is crucial for tax policy formulation.

This paper measures the elasticity of Sri Lanka's tax system for the period 1960 - 1994 in an attempt to provide some insight as to the revenue responsiveness of Sri Lanka's tax structure. Although a number of methodologies may be employed to determine the elasticity of a tax structure, the data requirements of these techniques necessarily limit their usage in most instances.² This paper attempts to empirically examine tax elasticity in Sri Lanka by resorting to the traditional time series regression approach albeit with improved methodology. The rest of the paper is organised as follows. Section 2 introduces the concept of tax elasticity and provides a definition of tax responsiveness. Section 3 discusses in brief the theoretical framework for the empirical measurement of revenue responsiveness. Section 4 outlines the methodology involved in the empirical estimation of elasticities while providing details of the estimation procedure itself. This section also provides a data description for the time series analysis. Section 5 gives the results of the elasticity estimation. A conclusion follows.

2. Tax Elasticity

In the public finance literature, tax elasticity is defined in a number of ways. Elasticity can be generally defined as the change in tax revenue directly arising from a unit change in income. More specifically, elasticity is defined as the ratio of the proportionate change in tax to the proportionate change in income as follows:

$$\begin{aligned} E &= T/T / Y/Y \\ &= T / Y / T/Y \end{aligned} \tag{1}$$

where E = elasticity
 T = tax payments
 Y = income

2/ Johnson and Lambert (1989) point to four methods of measuring empirically income tax revenue responsiveness to growth in incomes; the regression approach, the exact calculation method, the linear pareto model and the simulation method.

In a simple tax function where $T = T(Y)$, equation (1) can also give rise to a definition of elasticity as the ratio of the Marginal Tax Rate (MTR) to the Average Tax Rate (ATR).

$$E = MTR / ATR \tag{2}$$

where

$$\begin{aligned} MTR &= T / Y \\ &= dt / dy \\ &= T'(Y) \end{aligned} \tag{3}$$

and

$$ATR = T / Y \tag{4}$$

ATR as defined above is total tax payments as a proportion of income. MTR can be said to represent the “tax take from a given unit (£1) increase in income” (Johnson and Lambert, 1989).³ In other words, it is the rate of tax applied on an incremental unit of income.

2.1 Aggregating Tax Elasticities

A widely used measure of tax elasticity is the definition of tax elasticity as the weighted average of the sum of the elasticities of separate taxes that often have widely divergent responses to changes in income (Mansfield, 1972). Overall tax elasticity therefore is determined through a weighted sum of elasticities of individual taxes as follows:

$$E_{TY} = \frac{T_1}{T_t} \frac{T_1 Y}{Y T_1} + \dots \frac{T_k}{T_t} \frac{T_k Y}{Y T_k} + \dots \frac{T_n}{T_t} \frac{T_n Y}{Y T_n} \tag{5}$$

where

E_{TY} = elasticity of total tax revenue to income

T_t = total tax revenue

T_k, T_n = tax revenue from k^{th} and n^{th} taxes in a system of n taxes

Y = income

³/ MTR in this paper corresponds to the Effective Marginal Rate (EMR) measure used by Johnson and Lambert (1989) and Lambert (1993).

The above definition of tax elasticity is based on the definition of the elasticity of individual taxes which can be separated into two components - tax to base elasticity and base to income elasticity as follows:

$$E_{tky} = \frac{T_k}{B_k} \frac{B_k}{T_k} \frac{B_k}{Y} \frac{Y}{B_k} \quad (6)$$

where

B_k = tax base of the k^{th} tax

and the bracketed expression on the left hand side of equation (6) constitutes the tax to base elasticity of the k^{th} tax and the bracketed expression on the right hand side represents the base to income elasticity of the k^{th} tax. From equation (6) the elasticity of total revenue to income can be shown to depend on the product of the tax to base and base to income elasticities of individual taxes weighted by the importance of the individual taxes in the tax structure as follows:

$$E_{Ty} = \frac{T_1}{T} \frac{T_1}{B_1} \frac{B_1}{T_1} \frac{B_1}{Y} \frac{Y}{B_1} + \dots \frac{T_n}{T} \frac{T_n}{B_n} \frac{B_n}{T_n} \frac{B_n}{Y} \frac{Y}{B_n} \quad (7)$$

An advantage of using such a definition is the ability to identify factors responsible for rapid or lagged revenue growth. Factors that affect tax to base elasticity such as tax rates, exemptions and improvements in tax administration are within the control of the fiscal authorities thereby making this measure important for policy purposes. Base to income elasticity on the other hand is determined largely by the way in which the economic structure responds to growth.

It may be appropriate at this juncture to highlight the distinction between two measures of revenue responsiveness, the concepts of elasticity and buoyancy. Tax elasticity measures the built-in response of revenues to changes in income, while tax buoyancy quantifies the total change in revenue due to changes in income. Tax elasticity in other words, measures the responsiveness of tax revenue excluding the effect of discretionary changes taken by authorities to maintain short term revenue objectives. Elasticity compares the growth in tax revenue with that of GDP on the assumption that a particular tax structure prevails throughout the period under study. In other words, tax elasticity captures the responsiveness of tax revenue to changes in income assuming an

unchanged tax structure while buoyancy measures the responsiveness of revenue to a changed tax system. An elasticity coefficient of one would indicate a similar growth for both revenue and GDP while a coefficient less than one would show lagged revenue growth compared to GDP growth. An elasticity of more than one would indicate revenue growth exceeding GDP growth. Likewise, a buoyancy of one would indicate a revenue growth in line with GDP growth. A buoyancy of less than one would be indicative of a growth in revenue which is less than proportionate to GDP growth while a buoyancy of more than one would show a more than proportionate growth in revenue.

Tax elasticity and buoyancy constitute only two measures encountered in the public finance literature to quantify tax revenue responsiveness to growth in incomes. The other widely used measures are the Average Rate Responsiveness (ARR) measure, the Gross Earnings Deflator (GED) and the Marginal Rate Responsiveness (MRR) measure [(Johnson and Lambert, 1989) (Lambert, 1993)].

3. Measuring Revenue Responsiveness Empirically

Johnson and Lambert (1989) point to four methods of measuring empirically income tax revenue responsiveness to growth in income. These comprise the Regression approach [(Prest 1962), (Tanzi 1969,1976), (Jayasundara 1989), (Ram 1991)], the Exact Calculation method [(Hutton and Lambert 1980), (Fries, Hutton and Lambert 1982)], the Linear Pareto model (Hutton and Lambert 1982a), and the Simulation method [(Dorrington 1974), (Hutton and Lambert 1982b), (Caminada and Goudswaard 1996)]. However, other methodologies have also been utilised to measure elasticity. Among contributors to other approaches have been Choudhry (1979) where a divisia index approach based on a productivity concept has been used, and Creedy and Gemmel (1982) who have utilised a tax model to examine the elasticity of the UK income tax. Empirically, the regression approach has been the most extensively adopted methodology to examine tax elasticities. As this paper also utilises a time series regression analysis to estimate elasticities, discussion will now focus upon the regression methodology.

3.1 Regression Methodology

A typical log linear specification of an equation of this form is:

$$\ln T_i = a + b \ln X_i + e_i \quad (8)$$

where T_i = tax revenue from i^{th} observation
 X_i = tax base of i^{th} observation

Elasticity in this case is measured by the coefficient b . The regression method is based on the functional form

$$T = Ax^b \quad (9)$$

where it is assumed that when incomes change by a certain factor k , tax liabilities also change by k^b which leads to an increase in tax revenues. The assumption of constant proportionality between t and x^b in this method does not take into account a change in the distribution of income in time series analyses, although additional regressors might be added to capture these and other effects.

A tax system may change due to discretionary measures such as rate revisions, expansion in the coverage of various taxes or the imposition of new taxes. Therefore, the estimation of tax elasticity requires an adjustment to the actual revenue series so as to separate the growth in revenue arising from discretionary changes from that due to automatic changes. This adjustment to tax revenue is made in order to distinguish tax elasticity from tax buoyancy.

There are three major ways of adjusting a revenue series; the constant rate method, the proportional adjustment method and the dummy variable method. The choice of adjustment method employed depends on factors such as the availability of data on tax changes and the type and frequency of such changes. The proportional adjustment method requires calculation of the revenue implications of discretionary measures. Similarly, the constant rate structure method requires disaggregated data on tax rates and tax bases. The dummy variable method on the other hand can not be used when there are frequent discretionary changes. Attention will now focus on a brief discussion of the proportional adjustment method as this methodology is used to adjust revenues in this paper.

3.2 Proportional Adjustment Method

The proportional adjustment method adjusts a historical revenue series according to a particular years tax structure on the assumption that this particular tax structure is maintained throughout the period under consideration. Thus, this method basically involves two steps. Firstly, observed revenue data for each year are adjusted for discretionary changes by removing from such data the estimated revenue impact of discretionary changes. This gives an estimate of the automatic growth in revenue between two successive years. Secondly, the series are converted to the first year's basis by adjusting the year to year changes by the ratio of the tax yield on the basis of the first year rates to the actual tax yield (Chelliah and Chand, 1974). Thus, the proportional adjustment method can be used to construct a hypothetical revenue

series in two ways - a series of accumulated ratios going forward from a reference year or a series of decumulated ratios going backward from a base year. Numerically, the accumulated series can be derived as follows:

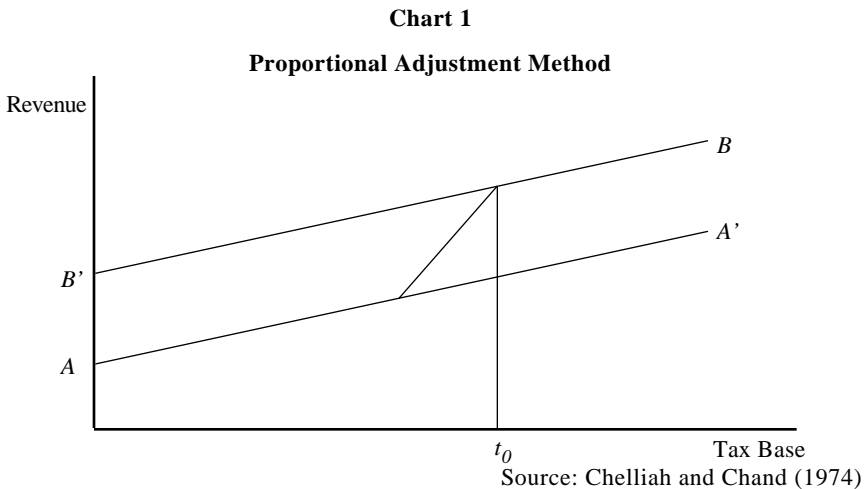
$$T_{1,j} = T_{1,j-1} + \frac{(T_j - D_j - T_{j-1})}{T_{j-1}} \cdot T_{1,j-1} \quad (10)$$

where T_j = actual revenue in j^{th} year
 D_j = revenue impact of discretionary changes
 $T_{1,j}$ = revenue in j^{th} year adjusted to structure of i^{th} year which is base year

In the above case, the reference year for the series constitutes the first year of the series. Similarly, a decumulated adjusted revenue series can also be computed with the last year of the data series constituting the reference year. The general formula used in the construction of such a revenue series can be shown as follows:

$$T_{n,j} = T_j \frac{T_{j+1}}{T_{j,j+1}} \frac{T_{j+2}}{T_{j+1,j+2}} \dots \frac{T_n}{T_{n-1,n}} \quad (11)$$

Graphically, the two series can be illustrated as in chart 1. The line AB represents the actual unadjusted revenue series with a revenue raising



discretionary action taking place at $t = t_0$. An adjusted revenue series using the first year tax structure as the base year is shown by line AA' . Line AA' adjusts the observed revenue series by subtracting from all observations the revenue impact of the discretionary change subsequent to the discretionary action at time period t_0 . Similarly, line BB' shows an adjusted revenue series with the last year taken as the base year where the revenue impact of the discretionary change has been added to revenue observations occurring prior to the changed tax structure.

An important assumption of the proportional adjustment method is that the revenue impact of the discretionary measure grows in proportion to total revenue. This implies that the proportional adjustment method does not alter the elasticity of the tax system although the tax yield may change due to such actions. In effect, what is derived from the elasticity estimate is an average elasticity of all the tax structures under consideration.

4. Empirical Analysis

4.1 Data

The paper adopts the Government Finance Statistics (GFS) classification used by the IMF to categorise tax revenue. In line with this classification, tax revenues are classified in accordance with the bases upon which they are levied or the activities due to which the tax liability arises.⁴ Taxes for which several tax bases apply are categorised into the most prominent tax base while fines and interest charges paid for late payment of various taxes are covered under the specific taxes concerned. Since the tax base or the activity concept is defined by law, this classification facilitates economic analysis as taxes constitute an additional cost in supply and demand relationships (GFS, 1986).

The adoption of a tax base categorisation for government revenue necessitated the compilation of a new tax revenue table for Sri Lanka for the period 1950-1996.⁵ Taxes were categorised into the following bases; income and profit, domestic goods and services, international trade, property and a

4/ For example, income taxes are categorised as taxes on income, profit and capital gains as the tax base of income taxes constitute income, profit and capital gains. Import and export taxes are classified as taxes on international trade and transactions as these taxes arise from the importation and exportation of goods.

5/ Prior to 1965 the economic classification of Sri Lanka's revenue was based on the SNA system of the United Nations which categorised tax revenue into current and capital receipts. Before 1955 tax revenue was compartmentalised into direct and indirect taxes wherein the distinction between these two sources was based on the relationship between the government and the taxpayer and not on the shiftability of the tax.

miscellaneous tax base. Taxes on income and profit constitute those levied on the actual or presumptive income of individuals and profits of businesses.⁶ Taxes on domestic goods and services include all taxes levied on the production, sale and transfer of goods while incorporating taxes on specific services as well as those imposed on the usage of goods. Thus, turnover and excise taxes constitute major categories under this heading while other important such taxes include license taxes and revenue obtained from government monopolies.⁷ Import and export duties comprise the major taxes levied on international trade and transactions.⁸ FEECs revenue is also classified under this category as they represent a transfer to the government of exchange profits resulting from the maintenance of a dual exchange rate. Foreign exchange taxes which were imposed during the pre-1977 period on foreign exchange obtained for travel purposes are also included in this category as they constitute a levy on the payment of invisible imports and exports. Property taxation is defined in accordance to the use, ownership, and the transfer of wealth of movable and immovable property. The main components under property taxation comprise estate duties, wealth taxes, gift taxes and taxes on financial and capital transactions. The tax revenue database compiled in line with the GFS classification for the period 1950-1996 for Sri Lanka is given in Appendix 1.

As legal bases were not available for all tax categories, proxy bases were used for estimating tax revenue elasticities. The proxy bases used for the empirical estimation constituted variables from the national accounts and the balance of payments as the tax categories chosen for the estimation can be associated with bases that cover large parts of economic activity in the country.

Proxy Tax Bases	
<u>Tax Revenue</u>	<u>Proxy Base</u>
Income Tax	GDP at factor cost current prices
Turnover Tax	Private consumption at market prices
Excise Tax	Private consumption
Import Duties	Imports of goods and services
Total Taxes	GDP at current market prices

6/ Revenue from taxes on capital gains are also enlisted under this tax base.

7/ The profits of fiscal monopolies constituted an important revenue source during the pre-1977 period as they represented the exercise of monopoly powers of the government for tax purposes.

8/ Taxes on international trade cover levies on goods shipped in or out of the country.

GDP at factor cost constituted the proxy base for income taxes as the growth of personal and corporate income is reflected in the Gross Domestic Product. Private consumption expenditure is used as a proxy base for turnover taxes as consumption expenditure reflects such taxes which are borne by consumers.⁹ Private consumption is also used for the estimation of excise tax elasticities as excise taxation constitutes a consumption based tax. Import duty elasticities are estimated on a proxy base consisting of imports of goods and services in value terms as import duties are levied on this tax base. Gross Domestic Product at current market prices constitutes the proxy base for total tax revenue.

As the computation of tax elasticities necessitates an adjustment to the observed revenue series, the proportional adjustment method was employed in this paper to adjust the actual revenue series. As mentioned before, the proportional adjustment method adjusts the tax yields in years prior to the reference year to give an indication of the revenue collections that would have been had the reference years tax system been in force throughout the period under study. This method was adopted as the data requirements for this methodology are minimal in that apart from actual revenue collections, what is required is a quantitative impact of discretionary measures. Data on discretionary changes were obtained from budget speeches while actual and estimated revenue data were obtained from the Government Estimates of Revenue and Expenditure and the Central Bank Annual Reports.¹⁰ Appendix table 2 gives the revenue impact of the discretionary tax changes.¹¹

The methodology of constructing an adjusted revenue series can be demonstrated as follows: For a series of actual revenue collections,

$$T_1, T_2, \dots, T_n$$

and a series of discretionary measures

$$D_1, D_2, \dots, D_n$$

the adjusted revenue for a particular year can be obtained from the equation:

9/ The forward shifting of taxes by firms to consumers is assumed here.

10/ Although budget presentations are not the only occasion when changes to the revenue structure are made, nevertheless they give a fair indication of important changes made to the tax system.

11/ When a tax measure is announced, it is usually quantified in order to examine the impact on revenue. Appendix table 2 gives ex-ante estimates of tax measures. The paper corrects ex-ante budget estimates by applying ratios of actual to estimated overall yield for each tax.

$$AT_{n-1} = T_{n-1} (T_n / T_n - D_n)$$

where AT = adjusted tax revenue
 T = actual tax revenue
 D = revenue effect of discretionary measure

However, for the reference year,

$$AT_n = T_n$$

For each year where a discretionary action takes place, a “discretionary factor”, $(T_n / T_n - D_n)$, is calculated excluding the revenue amount resulting from the legal action for that particular year. Discretionary factors are calculated for all years in which such changes occur. The adjusted revenue series is obtained by multiplying the previous year’s revenues by these discretionary factors. The adjusted revenue series gives an approximation of the revenue which could have been obtained had these measures been in force during the previous years. The adjusted tax revenue series is shown in Appendix 3.

A problem encountered with the use of budgetary estimates of discretionary measures is that the actual revenue effect of the discretionary change may differ from the ex-ante budget estimate. One possible method of overcoming this problem is to correct ex-ante budget estimates by applying ratios of actual to estimated overall yield of each tax (IMF, 1993). An assumption underlying this approach is that the percentage error in estimating the revenue effect of a discretionary change would be about the same as that arising from forecasting the overall yield of the same tax (IMF, 1993). Therefore, in order to adjust for the error in forecasting discretionary changes in Sri Lanka, revenue from this measure was adjusted by the ratio of actual to estimated revenue. Appendix table 4 gives the ratios of actual to estimated revenues.

4.2 Methodology

The paper utilises a time series regression approach to estimate elasticities for income, turnover, excise and import taxes and total tax revenue. In order to compare the impact of discretionary changes, tax buoyancies are also estimated for the same taxes.

The estimation of tax elasticity through regression analysis is based on the partitioning approach whereby tax elasticity is subdivided into tax to base and base to income elasticity. The functional form of the equation for computing tax to base elasticity is in log linear specification as follows:¹²

^{12/} The logarithm form is chosen as this gives directly an estimate of elasticity.

$$\ln T = a + b \ln X$$

where T = adjusted tax revenue
 X = tax base

Similarly, the regression used to estimate base to income elasticity is as follows:

$$\ln B = a + c \ln Y$$

where B = tax base
 Y = GDP at market prices

The coefficients b and c in the above two equations give an estimate of the respective elasticities. The product of tax to base and base to income elasticities ($b * c$) gives an estimate of overall elasticity in this instance. A list of variables used in the elasticity estimation is given below.

Variable List

LAIT	= Log adjusted income taxes
LATT	= Log adjusted turnover taxes
LAEXCT	= Log adjusted excise taxes
LAEXPT	= Log adjusted export taxes
LAIMPT	= Log adjusted import taxes
LATTR	= Log adjusted total tax revenue
LPC	= Log private consumption
LIMP	= Log imports (value)
LGDPF	= Log gross domestic product at factor prices
LGDPM	= Log gross domestic product at market prices
DP	= Dummy variable for import duty estimation
IMPD4	= Dummy variable for total tax revenue estimation
LITD	= Dummy variable for income tax estimation
LAITD	= Dummy variable for income tax estimation
LATTD1	= Dummy variable for turnover tax estimation
LATTD2	= Dummy variable for turnover tax estimation
LATTD	= Dummy variable for turnover tax estimation
LAEXCTD1	= Dummy variable for excise tax estimation
SLGDPD	= Dummy variable for total tax revenue
Y	= Fitted values of LGDPM

The first step in seeking a methodology for modelling any economic relationship is to ascertain the stationarity of the variables under scrutiny.¹³

13/ Stationarity is an important concept in econometrics since the standard regression model makes assumptions regarding the stationarity of the error term and the variables. A stationary (weakly) time series has a constant mean and variance for all t .

Therefore, a crucial preliminary task in the estimation procedure is to check for the stationarity of variables by testing for their order of integration.¹⁴ The data were tested for the order of integration through an Augmented Dickey Fuller (ADF) test and checked for the presence of unit roots.¹⁵

The results of the ADF test are shown in Table 1. The ADF test shows the variables as being $I(1)$ with one unit root although a significant ADF- t statistic is obtained for the first difference of LGDPF only at the 5 per cent level.

Table 1
ADF Test Results

Variable	$I(0)$	$I(1)$
LAIT	-2.08	-7.22
LATT	-39.82	-
LAEXCT	-19.97	-
LAIMPT	-0.80	-6.22
LATTR	-1.04	-6.09
LPC	-2.29	-3.94
LIMP	-2.01	-4.70
LGDPF	-2.56	-4.15
LGDPM	-2.77	-4.47
LGDE	-2.38	-4.04
LIT	-1.93	-7.27
LTT	-9.22	-
LEXCT	-2.71	-5.91
LIMPT	-1.64	-4.62
LTTR	-1.70	-6.02

Source: Author's Estimates.

Note: $I(0)$ and $I(1)$ refer to the level and the first difference of the variable respectively. The figures shown are t ratios for which a suggested significance value in the ADF test is usually -3.0 or below (Dickey and Fuller, 1979, 1981). A constant and time trend were used in all the unit root estimations.

14/ A variable x_t is said to be integrated to the order d , $x_t \sim I(d)$, if it must be differenced at least d times to reach stationarity.

15/ The presence of unit roots has far reaching implications for economic analysis. Under the unit root hypothesis, random shocks have a permanent effect making the system nonstationary. The ADF test can be used to test for unit roots through the following equation:

$$y_t = \alpha y_{t-1} + \epsilon_t \quad \text{where } \alpha = \rho - 1$$

Testing for unit roots entails testing whether $\alpha = 1$ or $\alpha < 1$. If these conditions are fulfilled, the y_t series is said to have unit roots. However, the usual caveat regarding the low power of ADF tests in distinguishing between unit roots and near unit roots in small samples applies here. See Dickey and Fuller (1981).

In performing unit root tests, however, care must be taken if structural breaks are suspected in the data series. The Augmented Dickey Fuller test is biased towards *non-rejection* of unit roots when structural breaks are incorporated in the data. In such cases, a Perron test can be performed to check for unit roots in the presence of a structural change.¹⁶

As the ADF test for Sri Lankan data displayed unit roots and the existence of structural breaks in a data series biases the ADF statistic towards *non-rejection* of unit roots, a Perron test was also carried out for the data series displaying unit roots.¹⁷ As the Perron test plays a pivotal role in this econometric analysis, it may be useful at this juncture, to engage in a short discussion of this methodology.

The Perron test constitutes a unit root test for a time series affected by a structural change in its mean. The basic premise underlying this methodology is that shocks that affect an economy may be considered as “outlier events” imposing only a transitory as opposed to a permanent effect on the system.¹⁸ The change is considered as an outlier as it appears very big in relation to other changes observed in the time series. Perron removes the sudden change from the noise function and introduces it in the deterministic part of the series. The noise function is then analysed without the particular “extraordinary event”. An assumption underlying this methodology is that shocks are exogenous and are not the result of the data generating process. The statistical methodology applied in this test is an extension of the Dickey Fuller test.

In statistical terms, the Perron methodology can be described as follows. For a time series characterised with a one time change in the structure occurring at time period T_B ($I < T_B < T$), the null hypothesis can be given as:

$$y_t = \mu_t + y_{t-1} + dD(TB)_t + (\mu_2 - \mu_1) DU_t + e_t$$

16/ Another econometric procedure which can be performed when testing for unit roots in the presence of structural breaks involves splitting the sample and carrying out a Dickey Fuller test on each *sub-sample* (Enders, 1995). However, in this case, the degrees of freedom for each regression become less. The Perron methodology constitutes a better test as it utilises the full sample.

17/ Perron (1989) challenges Nelson Plosser by showing that most variables do not have unit root processes but are trend stationary processes having structural breaks. Therefore, Perron’s test involves testing for unit roots in the presence of structural change either at a known or unknown breakpoint in time. From a series of Monte Carlo experiments, Perron finds that the *non-rejection* of the unit root hypothesis becomes more probable as the magnitude of the change in the mean increases. See also Perron, 1990, 1992.

18/ Nelson and Plosser (1982) argue that most macroeconomic time series are characterised by stochastic shocks which are nonstationary. The total variability of a time series over time is therefore explained in terms of greater variability on the part of permanent shocks than transitory shocks.

where $D(TB) = 1$ if $t = T_B + 1$ and 0 otherwise

$$DU_t = 1 \text{ if } t > T_B \text{ and } 0 \text{ otherwise}$$

The above model allows for a change in the intercept of the trend function as well as a change in the slope of the trend function. The alternative hypothesis in this case can be shown as follows:

$$y_t = \mu_1 + \beta_1 t + (\mu_2 - \mu_1) DU_t + (\beta_2 - \beta_1) DT_t + e_t$$

where $DT_t = t$ if $t > T_B$ and 0 otherwise

The Dickey Fuller (*DF*) procedure is used to test for unit roots in the presence of structural break. When errors are uncorrelated, the *DF* test used is

$$y_t = y_{t-1} + e_t$$

When the innovation sequence is correlated, the above approach is modified by the addition of extra lags of the first differences of the data as regressors as follows:¹⁹

$$y_t = y_{t-1} + c y_{t-j} + e_t$$

where $y_t = y_t - y_{t-1}$

In the above equation, $\sum c_i$, the sum of the autoregressive coefficients, is the OLS estimator and the test for the existence of unit roots comprises $\sum c_i = 1$. The above approach implies an instantaneous change in the trend function. However, there may be times when the economy reacts gradually to a change in the trend function. One way of incorporating such a change is to suppose that the economy responds to a shock to the trend function in the same way as it reacts to any other shock.²⁰ Perron then extends the *DF* framework by adding dummy variables and constructing a model by nesting null and alternative hypotheses as follows:

$$y_t = \mu + DU_t + t + DT_t + dD(TB)_t + \sum_{i=1}^k c_i y_{t-i} + e_t$$

A visual inspection of the data for Sri Lanka for the period 1950-1994 reveals a sudden shift in the mean of the series around 1977. Appendix 5

19/ This approach follows that of Dickey and Fuller (1979) and Said and Dickey (1984).

20/ This methodology is consistent with the “innovational outlier” specification in literature on outlier models.

gives a time plot of the variables used for the elasticity estimation. Borrowing upon terminology from Perron, this sudden change can be viewed as “extraordinary” against the background of the general historical pattern observed in the series. The reforms initiated with the economic liberalisation in 1977 can be held responsible for this sudden change. Therefore the year 1977 was chosen to represent the break point for the structural break since far reaching economic reforms were undertaken during this year. The Perron test was performed for each variable with unit roots by estimating the following equation:

$$y_t = a_0 + \mu_1 D_L + \mu_2 D_P + \beta_2 t + \beta_1 y_{t-1} + \sum_{i=1}^k y_{t-i}$$

where, D_L = level dummy and $D_L = 1$ if $t >$ and $D_L = 0$ otherwise
 D_P = pulse dummy and $D_P = 1$ if $t =$ +1 and zero otherwise
 $=$ /T (proportion of observations prior to break)
 $=$ breakpoint = 1977
 t = trend

The null hypothesis is that of a unit root process with a one time change in the mean of a unit root process with $\beta_1 = 1$, $\beta_2 = 0$ and $\mu_2 = 0$. The alternative hypothesis predicts a trend stationary model with a permanent one time break with $\beta_1 < 1$ and $\mu_1 = 0$. The results of the Perron test are given in Table 2.

Results from the Perron test do not indicate support for the unit root hypothesis. The estimated values of β_1 for all variables are significantly different from unity at the 5 percent level as shown by the computed t values which are greater than the critical values calculated by Perron. In fact, most variables seem to have a deterministic trend with β_2 coefficients displaying significant t ratios. The level dummy as measured by μ_1 seems to be insignificant for all variables. The pulse dummy as measured by μ_2 on the other hand seems to be significant for the variables LAIMPT, LGDPF, LGDE, LIMP, LEXCT, LTTR and LIMPT. Thus, the Perron test seems to reject the null hypothesis of unit roots. The tax variables are stationary and justify the use of level variables in regression analysis.

In the light of the above results, a general to specific modelling strategy in log levels was adopted which seemed to give satisfactory results.²¹ In order

21/ The general model consisted of an Autoregressive Distributed Lag (ADL) model where the dependent variable is expressed as a function of its own values and current and lagged values of explanatory variables. Considering the small sample nature of the data series, lag lengths of up to three were generally incorporated. The specific model formulation was arrived at by gradually reducing the general model by testing for linear restrictions through Wald tests. See Gilbert (1986), Charemza (1992) and Hendry (1995) for more information on general to specific modelling.

Table 2
Perron Test Results

Variable	T	K		μ_1	μ_2	1	2
LAIT	42	2	0.6	0.11 (0.65)	-0.14 (-0.62)	0.84 (8.6)	0.01 (1.78)
LAIMPT	42	2	0.6	0.18 (1.59)	-1.02 (-5.6)	0.09 (16.14)	-0.001 (-0.18)
LATTR	34	10	0.5	-0.01 (-0.22)	0.02 (0.27)	0.76 (10.35)	0.02 (4.03)
LGDPF	40	5	0.6	-0.002 (-0.33)	0.15 (2.84)	0.87 (12.17)	0.02 (3.11)
LGDPM	40	5	0.6	-0.01 (-1.03)	0.06 (1.26)	0.93 (13.96)	0.01 (2.35)
LGDE	40	5	0.6	0.01 (0.75)	0.14 (2.89)	0.82 (12.11)	0.02 (3.31)
LIMP	43	4	0.6	0.01 (0.49)	0.22 (2.13)	0.82 (9.97)	0.02 (2.85)
LEXCT	38	2	0.7	0.08 (1.22)	0.22 (2.02)	0.58 (5.84)	0.07 (3.75)
LTTR	41	3	0.6	0.06 (0.81)	0.45 (4.71)	0.94 (19.44)	0.01 (1.92)
LIT	41	3	0.6	0.14 (1.02)	-0.1 (-0.15)	0.84 (9.29)	0.02 (2.21)
LIMPT	43	1	0.6	0.16 (1.2)	0.78 (4.09)	0.96 (23.04)	0.002 (0.56)

Source: Author's Estimates.

T = number of observations

k = lag length

* The figures in parentheses represent t ratios.

** Critical values for the Perron test consisting of a sample of 50 observations are as follows:

	<u>1 %</u>	<u>5%</u>
= 0.5	-4.09	-3.45
= 0.6	-4.11	-3.43

to compare the responsiveness of tax revenue during the *pre-reform* period and the *post-reform* period, elasticities were computed for three sample periods comprising the years 1960-1994, 1960-1977 and 1978-1994. The three sample periods of 1960-1977, 1978-1994 and 1960-1994 were chosen specifically to see the behaviour of the estimated coefficients during vastly different time periods in Sri Lanka's history. While the period 1960-1977 constituted an inward looking state controlled economic regime, the time period 1978-1994 represents an outward oriented market based economic regime. The sample period 1960-1994 incorporates both these economic regimes. The elasticity estimates presented in tables 8 and 9 were obtained from the product of tax to base and base to income elasticities.

4.2.1 Tax to Base Elasticities

The tax to base regressions for income taxes shown in Table 3 reflect the significance of GDP as well as income taxes lagged one period in the determination of income tax revenue. The explanatory power of the latter variable seems to be greater partly due to the fact that income taxes are very often subject to lags in collection. Moreover, as tax incentives in the form of tax holidays are a major component of the income tax system, the utilisation of these incentives would erode the tax base thereby lessening the tax to base

Table 3
Tax to Base Income Tax Regression Results*

LAIT	1960-1994	1960-1977	1978-1994
LAIT _{t-1}	0.72 (9.22)	0.54 (3.51)	0.71 (5.37)
LGDPF	0.22 (3.70)	0.35 (2.95)	0.22 (2.26)
LITD (1973=1)	–	0.33 (2.65)	–
LAITD (1989=1)	-0.61 (-3.99)	–	-0.59 (-3.50)
Test Statistics			
R ²	0.99	0.99	0.99
Durbin - h Statistic	-1.28	-1.30	-0.34
SEE	0.1513	0.1172	0.1635
RSS	0.7328	0.2060	0.3744

Source : Author's Estimates

* Figures below coefficients in parenthesis represent *t* ratios.

relationship between income taxes and GDP. The negative LAITD variable used in the income tax elasticity estimations reflects the sharp decline in income tax revenue collections on account of civil disturbances and slow economic growth in 1989. All test statistics for the three sub-periods seem to be significant. The Durbin-h statistic which tests for autocorrelation when lagged variables are present does not reject the null hypothesis of no autocorrelation for these regressions.

The tax to base regressions estimated for turnover taxes (Table 4) show the significance of the tax base private consumption in explaining turnover tax revenue. LPC is highly significant during all three sub-periods with the period 1978-1994 bearing a coefficient of 0.84 having the highest explanatory power in explaining turnover tax revenue. The LATTD1 dummy used in the turnover tax elasticity estimations for the period 1960-1977 reflects the introduction of the FEEC scheme in the form of a dual exchange rate system in May, 1968. As imports constitute a major component of private consumption,

Table 4
Tax to Base Turnover Tax Regression Results*

LATT	1960-1994	1960-1977	1978-1994
Constant	0.10 (0.62)	1.47 (4.99)	0.46 (-2.09)
LATT _{t-1}	0.10 (6.4)	0.12 (13.14)	–
LPC	0.71 (33.2)	0.55 (15.85)	0.84 (45.28)
LATTD1 (1969=1)	–	0.16 (2.68)	–
LATTD2 (1970=1)	–	-0.30 (-5.08)	–
LATTD (1981=1)	–	–	0.23 (3.83)
Test Statistics			
R ²	0.99	0.99	0.99
Durbin - d Statistic	–	–	1.98
Durbin - h Statistic	0.14	-0.84	–
SEE	0.09911	0.0554	0.0560
RSS	0.2652	0.0276	0.0439

Source : Author's Estimates

* Figures below coefficients in parenthesis represent *t* ratios.

the introduction of this scheme would have had a major impact on private consumption and therefore on turnover tax revenue collections. The positive LATTD dummy variable in the turnover tax estimations for the 1978-1994 period reflects the imposition of turnover taxes on imports in 1981 which shows a revenue augmentation impact for turnover taxes as a result of a base broadening effect. Test statistics for the turnover tax regression are also significant.

The short run elasticities for excise taxes generally point to low estimates (Table 5).

Table 5
Tax to Base Excise Tax Regression Results*

LAEXCT	1960-1994	1960-1977	1978-1994
Constant	1.07 (3.58)	-0.69 (-1.24)	6.70 (12.99)
LAEXCT _{t-1}	0.70 (7.11)	–	–
LPC	1.34 (3.18)	0.90 (14.77)	1.48 (2.59)
LPC _{t-1}	-1.22 (-3.03)	-	-1.29 (-2.33)
LAEXCTD1 (1988=1)	–	–	-0.30 (-2.75)
Test Statistics			
R ²	0.98	0.93	0.71
Durbin - d Statistic	–	1.43	1.60
Durbin - h Statistic	-0.40	–	–
SEE	0.1450	0.1506	0.1060
RSS	0.6309	0.3854	0.1461

Source : Author's Estimates

* Figures below coefficients in parenthesis represent *t* ratios.

During the period 1960-1994 the short run elasticity estimates amount to 0.12 while during the *post-liberalisation* period this estimate improves to 0.19. The specific nature of the excise taxation can largely explain the low elasticities found in this revenue source. The short run elasticity estimate for excise tax revenue during the 1960-1977 period is relatively high at 0.90 due to the improved effort put into tax administration during this period. All test statistics are significant for all estimations.

Import tax revenue (Table 6) reflect very low tax to base elasticities during the 1960-1994 period and 1960-1977 sub-period. An important factor that seems to be affecting the results of the estimation for import taxes seems to be the imposition of import restrictions in the form of quotas during the 1970-1977 period. As the period 1970-1977 was characterised by quantitative restrictions, this would have exerted a downward bias on the estimates. The insignificant t statistic observed for the tax base variable LIMP for the elasticity estimation of 1960-1977 provides further evidence of the importance of import substitution policies during this period. On the other hand, import duties, lagged one period, turns out to be an insignificant explanatory variable for the elasticity estimation during the *post-liberalisation* period. This can be due to the fact that import duties are usually collected promptly, without a lag, as goods can not be released before payment of duty.

Table 6
Tax to Base Import Tax Regression Results*

LAIMPT	1960-1994	1960-1977	1978-1994
LAIMPT _{t-1}	0.94 (45.31)	0.93 (21.79)	0.23 (1.42)
LIMP	0.06 (3.29)	0.07 (1.45)	0.63 (4.70)
DP (1978=1)	-0.88 (5.08)	—	—
Test Statistics			
R ²	0.99	0.99	0.99
Durbin - h Statistic	1.17	1.54	1.83
SEE	0.1709	0.1931	0.1796
RSS	0.9347	0.5966	0.4839

Source : Author's Estimates

* Figures below coefficients in parenthesis represent t ratios.

However, the generally low import elasticity estimates obtained during the *post-liberalisation* period can be attributed to the plethora of duty waivers and exemptions available during this period. The DP dummy used in the import duty elasticity calculations in 1978 reflects the adoption of liberalised policies in November, 1977.

Tax to base elasticities for total taxes (Table 7) also reflect very low elasticity estimates. An important factor that seems to be affecting the results of the estimation for total tax revenue seems to be the imposition of import

restrictions in the form of quotas during the 1970-1977 period. Moreover, the low elasticities observed in excise taxes would also have contributed to the low estimate for total taxes. A noteworthy feature is the high R^2 observed for all the regressions. This is as expected as many aggregate economic models assume that tax revenues are functionally related to GDP (Mansfield, 1972). This bears out such an assumption on purely statistical grounds as opposed to causative grounds.

Table 7
Tax to Base Total Tax Regression Results*

LATTR	1960-1994	1960-1977	1978-1994
Constant	0.95 (2.69)	—	—
LATTR _{t-1}	0.76 (10.81)	0.85 (22.45)	0.90 (17.42)
LGDPM	0.14 (4.07)	0.15 (3.89)	0.77 (3.09)
LGDPM _{t-1}	—	—	-0.69 (-2.96)
SLGDPD	0.02 (3.40)	—	0.23 (4.0)
Test Statistics			
R ²	0.99	0.99	0.99
Durbin-h Statistic	0.52	-0.98	-0.54
SEE	0.0682	0.0722	0.0515
RSS	0.1441	0.0834-	0.0345

Source : Author's Estimates

* Figures below coefficients in parenthesis represent t ratios.

4.2.2 Base to Income Elasticities

In estimating base to income elasticities, a problem encountered in the estimation procedure was the existence of simultaneity bias in the equations.²² The variables LPC, LGDPF, LIMP and LGDPM were thought to be endogenous

^{22/} The bias in the base to income elasticities arises from the simultaneous determination of the dependent and the exogenous variables. For example, in a simple consumption function of the form $C_t = \alpha + Y_t + \mu_t$, the variables Y_t and C_t are simultaneously dependent on each other as $Y_t = C_t + I_t + G_t + (X - M)$. OLS is not consistent in this case as the endogenous variables in the r.h.s. are correlated with the error term.

and hence a Two Stage Least Squares (2SLS) approach was adopted in estimating these equations. The structural form of the base to income elasticity equations for private consumption, to cite one example, was as follows:

$$LPC = \alpha_1 + \alpha_2 LGDPM + u$$

As LGDPM constituted the endogenous variable in all the base to income equations to be purged of its stochastic content, the first stage of the 2SLS procedure involved the estimation of the following regression to obtain fitted values of LGDPM:

$$LGDPM = 0.23 + 0.19LG + 0.82 LGDPM_{t-1}$$

(1.6) (3.1) (12.1)

R²=0.99, Durbin h statistic = 0.53 RSS= 0.14 SEE=0.05

Government expenditure (LG) and lagged LGDPM were two exogenous variables that were used to estimate the fitted values in the first stage of the 2SLS procedure. In the second stage, the fitted values, (Y), were used in the structural equations to estimate base to income elasticities. The fitted values satisfy two necessary conditions for a valid instrument; firstly, it has no correlation with the error term in the structural equation and secondly, it is highly correlated with the endogenous variable.

The base to income elasticities were estimated as follows:

$$LGDPM = -0.10 + 1.006Y - 0.12D$$

(-2.09) (195) (-3.15)

R² = 0.99 DW = 1.75 RSS = 0.09 SEE = 0.05

$$LPC = -0.38 + 1.38Y - 0.38Y_{t-1} - 0.19D$$

(-5.2) (9.2) (-2.4) (3.4)

R² = 0.99 Durbin - h = 0.90 RSS = 0.09 SEE = 0.05

$$LIMP = -0.72 + 0.71LIMP_{t-1} - 1.04Y_{t-1} + 1.36Y + 0.31D$$

(-2.5) (5.9) (-3.7) (4.2) (2.9)

R² = 0.99 Durbin - h = 0.92 RSS = 0.31 SEE = 0.10

Base to income elasticities were estimated for the periods 1960-1994, 1959-1977 and 1978-1994. The elasticity estimates in all cases, except import duties, turned out to be equal to one.²³ In the case of base to income elasticities of import duties, the estimated coefficient turned out to be 1.1081.

^{23/} As the elasticity estimates all turned out to be equal to unity, the regressions for the period 1960-1994 only are reported above.

5. Results

Long run and short run elasticities for the above mentioned taxes were computed from the regressions, the results of which are given in Tables 8 and 9.²⁴ As mentioned before, the overall elasticity of individual taxes was estimated by the product of the tax to base and base to income elasticities.

Table 8
Long Run Tax Elasticities*

Tax	1960-1994	1960-1977	1978-1994
Income taxes	0.78 (0.012)	0.76 (0.007)	0.76 (0.023)
Turnover taxes	0.80 (0.016)	0.63 (0.037)	0.84 (0.019)
Excise taxes	0.43 (0.073)	0.90 (0.062)	0.20 (0.040)
Import taxes	1.12 (0.067)	1.13 (0.099)	0.91 (0.006)
Total taxes	0.58 (0.045)	1.01 (0.014)	0.85 (0.032)

Source: Author's Estimates

* Standard errors are reported in parenthesis

Table 9
Short Run Tax Elasticities*

Tax	1960-1994	1960-1977	1978-1994
Income taxes	0.22 (0.15)	0.15 (0.12)	0.22 (0.16)
Turnover taxes	0.71 (0.10)	0.55 (0.05)	0.84 (0.06)
Excise taxes	0.12 (0.14)	0.90 (0.38)	0.19 (0.11)
Import taxes	0.06 (0.17)	0.07 (0.19)	0.63 (0.18)
Total taxes	0.14 (0.07)	0.15 (0.07)	0.08 (0.05)

Source: Author's Estimates

* Standard errors are reported in parenthesis

In order to see the effect of discretionary changes on tax revenues, buoyancies were also estimated for the above mentioned taxes.²⁵ The buoyancy estimates along with standard errors are given in Table 10.

Table 10
Tax Buoyancies*

Tax	1960-1994	1960-1977	1978-1994
Income taxes	0.94 (0.02)	0.92 (0.07)	0.97 (0.05)
Turnover taxes	1.35 (0.06)	1.62 (0.37)	1.18 (0.18)
Excise taxes	0.79 (0.13)	0.63 (0.56)	0.76 (0.66)
Import taxes	1.42 (0.21)	0.88 (0.06)	0.92 (0.02)
Total taxes	1.00 (0.15)	0.98 (0.23)	0.95 (0.11)

Source: Author's Estimates

* Standard errors are reported in parenthesis

The results from the elasticity estimation point to several noteworthy features of the Sri Lankan tax system. Firstly, low elasticities can be observed for all taxes during the period under study. The growth in tax revenues has not kept pace with that of tax bases. Income taxes show an elasticity estimate of 0.78 for the whole period under study. The elasticity estimates for the *pre-reform* and the *post-reform* periods at 0.76 show that income tax revenues have not increased in line with GDP growth. Excise taxes exhibit a very low elasticity of 0.20 during the *post-1977* period reflecting the combined effect of the specific nature of excise taxation and the high growth in private consumption during this period. In addition, factors such as the illicit production of liquor impose a negative effect on excise tax elasticity as this is not captured in the national accounts data. In contrast, the relatively high

24/ The long run elasticity of y with respect to x of an ADL equation $y_t = a_1x_t + b_2x_{t-1} + c_1y_{t-1}$ specified in logs can be derived as
$$= \frac{a_1 + b_2}{1 - c_1}$$

25/ A similar procedure to the elasticity estimation was adopted for the buoyancy estimation except that the dependent variable in the latter case constituted actual revenue as opposed to adjusted revenue.

elasticity of 0.90 observed for excise taxes during the 1970-1977 period points to strengthened tax administration during this period. Turnover taxes, in comparison to other tax sources, have been more responsive to increases in its tax base displaying long run coefficients of around 0.80 during the period under study. There seems to be no significant difference between the turnover tax elasticity estimates for the *pre-liberalisation* and the *post-liberalisation* periods. Import taxes as noted before record an elasticity estimate of unity prior to 1977 while the *post-1977* period witnesses an elasticity estimate of 0.80. The lower import tax elasticities obtained for the *post-liberalisation* period reflect the provision of duty waivers and exemptions prevalent during this period resulting in a lowering of the elasticity estimate. The elasticity for total tax revenue is 0.80 from 1978 onwards reflecting an inelastic tax structure even with the implementation of tax reforms.

Another distinct feature that can be observed from the above estimation is the generally lower elasticity estimates obtained for the short run. This is in line with a priori expectations when factors such as lags in collection would always make for delays in payment. Income taxes display very low short run elasticities which may be due to collection lags arising from low tax compliance and weak tax administration. Turnover taxes record relatively higher short run tax elasticities for all periods under study as these tax payments are made quarterly. In the case of excise taxes, the short run and the long run elasticities at 0.90 during the 1960-1977 period are quite high mainly due to strengthened tax administration during this period. The lowest short run elasticities are found in total tax revenue which is not a surprising result as collection lags in all sources of tax revenue will be incorporated in this variable.

As regards the finally preferred estimates, from an econometric point of view, estimates obtained from the longest sample period may be thought of as the preferred estimates as this sample period incorporates the largest number of observations. In such circumstances, the sample period 1960-1994 can be cited as the period bearing the desired estimates. However, in the case of Sri Lanka, this sample period incorporates the inward oriented, state interventionist and import and exchange controlled time period which would have had some impact on the elasticity estimates derived for this period. Moreover, the choice of preferred estimate must also be based on the purpose for which the elasticity estimates are being used. As revenue forecasting would be a priority area for which these elasticity coefficients can be used, utilising estimates from a sample period similar to the forecasting period would be desirable. As such, the elasticity coefficients arising from the sample period 1978-1994 can be chosen as the finally preferred estimates.

6. Conclusion

The time series analysis of tax elasticity reveals a very inelastic tax structure for the period 1960 - 1994. Taxes are not greatly responsive to changes in income with most elasticity coefficients registering below unity. The low elasticity observed in the Sri Lankan tax system is explained through factors such as exemptions, tax incentives, duty waivers, low compliance and vibrant sectors of the economy which are not subject to taxation. Thus, the automatic responsiveness of taxes to income is seen to be low. The *pre-reform* and the *post-reform* periods did not reveal a significant difference in elasticities for most taxes. In fact, the higher coefficients obtained through the buoyancy analysis point to the role of discretionary measures in maintaining a steady source of tax revenue throughout the period under study. Therefore, the tax reforms implemented during the *post-1977* period seem not to have brought about an increase in the elasticity of the tax system.

Bibliography

- Caminada, and K. Goudswaard**, (1996) "Progression and Revenue Effects of Income Tax Reform" *International Tax and Public Finance*, Vol.3: pp. 57-66
- Central Bank of Sri Lanka**. *Annual Reports and the Review of the Economy*. Colombo.1950-1996.
- Charemza, W**, and **D. Deadman**, (1992). *New Directions in Econometric Practice: General to Specific Modelling, Cointegration and Vector Autoregression*. (Cambridge: Edward Elgar).
- Chelliah, J.**, and **K. Chand**, (1974). "A Note on Techniques of Adjusting Tax Revenue Series for Discretionary Changes" Working Paper FAD/74/1, (Washington : IMF).
- Choudhry, N.** (1979). "Measuring the Elasticity of Tax Revenue: A Divisia Index Approach" *IMF Staff Papers*, Vol.26, pp. 87-122.
- Creedy, J.**, and **N. Gemmell**, (1982). "The Built-in Flexibility of Progressive Income Taxes: A Simple Model" *Public Finance*, Vol.37, No.3, pp. 361-371.
- Dickey, D. A.**, and **Fuller, W.A.** (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root" *Journal of the American Statistical Association*, Vol.74, pp. 427-431.
- (1981) "The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root" *Econometrica*, Vol.49, pp. 1057-1072.
- Dorrington, J.C.** (1974). "A Structural Approach to Estimating the Built-in Flexibility of United Kingdom Taxes on Personal Income" *Economic Journal*, Vol.84, pp. 576-594.
- Enders, W.** (1995). *Applied Econometric Time Series* (New York : John Wiley).
- Fries, A.**, **Hutton, J.P.**, and **Lambert, P.J.** (1982). "The Elasticity of the U.S. Individual Income Tax: Its Calculations, Determinants and Behaviour" *Review of Economics and Statistics*, Vol.64, pp. 147-151.
- Gilbert, C.** (1986). "Professor Hendry's Methodology" *Oxford Bulletin of Economics and Statistics*, Vol.48, pp. 283-307.
- Hendry, D.F.** (1995). *Dynamic Econometrics* (Oxford : Oxford University Press).
- Hutton, J.P.**, and **Lambert, P.J.** (1980). "Evaluating Income Tax Revenue Elasticities" *Economic Journal*, Vol.90, pp.901-906.
- (1982a). "Modelling the Effects of Income Growth and Discretionary Changes on the Sensitivity of U.K. Income Tax Revenue" *Economic Journal*, Vol.92, pp.145-155.

- (1982b). “Simulating the Revenue Elasticity of an Individual Income Tax” *Economic Letters*, Vol.9, pp.175-179.
- International Monetary Fund** (1993). “Workshop on Budget Forecasting”, INST/93-I/I-B-7W, Washington : IMF Institute.
- (1986), *A Manual on Government Finance Statistics*, 1986. Washington.
- Jayasundera, P.B.** (1989). “A Study of the Elasticity of the Tax System in Sri Lanka 1978/1988” *Staff Studies*, Vol. 17 No. 1 & 2, pp. 37-79.
- Johnson, P., and P.J. Lambert,** (1989). “Measuring the Responsiveness of Income Tax Revenue to Income Growth: A Review and some U.K. Values” *Fiscal Studies*, Vol.10, No.1, pp.1-18.
- Lambert, Peter J.** (1993). *The Distribution and Redistribution of Income: A Mathematical Analysis*. (Manchester: Manchester University Press).
- Mansfield, C.Y.** (1972). “Elasticity and Buoyancy of a Tax System: A Method Applied to Paraguay” *IMF Staff Papers*, Vol.19, pp.425-443.
- Ministry of Finance and Planning.** *Budget Speeches*, Colombo,1950-1994.
- *Estimates of Revenue and Expenditure* (various years). Colombo.
- Nelson, C.R., and Plosser, C.I.,** (1982). “Trends and Random Walks in Macroeconomic Time Series” *Journal of Monetary Economics*, Vol.10, pp.139-162.
- Perron, P.** (1989). “The Great Crash, the Oil Price Shock and the Unit Root Hypothesis” *Econometrica*, Vol.57, pp.1361-1401.
- (1990). “Testing for a Unit Root in a Time Series with a Changing Mean” *Journal of Business and Economic Statistics*, Vol.8, No.2, pp.153-162.
- (1992). “Non-stationarity and Level Shifts with an Application to Purchasing Power Parity” *Journal of Business and Economic Statistics*, July 1992, Vol.10, No.3, pp.301-320.
- Prest, A.R.**(1962). “The Sensitivity of the Yield of Personal Income Tax in the United Kingdom” *Economic Journal*, Vol.72, pp.576-596.
- Ram, R.** (1991). “Elasticity of Individual Income Tax in the United States” *National Tax Journal*, Vol.44, pp.93-99.
- Tanzi, V.** (1969). “Measuring the Sensitivity of the Federal Income Tax from Cross Section Data: A New Approach” *Review of Economics and Statistics*, Vol.84, pp.576-594.
- (1976). “The Sensitivity of the Yield of the U.S. Individual Income Tax and the Tax Reforms of the Past Decade” *IMF Staff Papers*, Vol.23, pp.441-452.
- World Bank,** (1991), *Lessons of Tax Reform*. (Washington: World Bank).

Appendix 1

(Rs. Million)

Tax Revenue																
Tax Category	49/50	50/51	51/52	52/53	53/54	54/55	55/56	56/57	57/58	58/59	59/60	60/61	61/62	62/63	63/64	64/65
Tax on Income, Profit & Cap. Gains	117	134	205	232	217	206	300	271	264	201	194	271	276	277	289	297
Personal																
Corporate																
Domestic Taxes on Goods & Services	48	55	56	72	76	72	86	97	118	127	181	168	199	241	271	338
General Sales & TT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	35
Manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	35
Non-Manufacturing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selective Sales (Excise)	3	3	3	6	9	10	12	19	28	39	43	54	78	95	108	126
Liquor																
Tobacco																
Other																
Defence Levy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Licence Tax	13	15	16	21	22	18	19	20	32	26	58	44	38	35	41	39
Heavy Oil Motor Vehicle Tax	0	1	1	2	2	3	3	4	3	3	1	2	9	11	14	42
Surplus of Govt. Monopolies	29	33	33	39	39	34	46	50	52	55	76	65	72	98	88	90
Taxes on Specific Services	3	4	4	5	5	8	6	4	3	3	3	3	2	2	5	6
Betting/Lottery Tax	3	4	4	5	5	8	6	4	3	3	3	3	2	2	5	6
Taxes on International Trade	357	529	489	446	505	630	610	629	618	698	708	733	758	677	765	756
Import Duties	188	245	260	251	244	258	286	303	292	367	406	435	465	397	481	436
Export Duties	169	284	229	195	261	372	324	326	326	331	302	298	293	280	280	315
Foreign Exchange Taxes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5
FEECs Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taxes on Property	6	4	6	5	7	7	6	3	16	16	19	31	30	32	32	37
Estate Duties	6	4	6	5	7	7	6	3	5	7	8	10	9	8	8	7
Wealth Tax / Gift Tax	0	0	0	0	0	0	0	0	0	0	1	12	12	12	13	19
Taxes on Financial & Cap. Trans.	0	0	0	0	0	0	0	0	11	9	10	9	9	12	11	11
Treasury Bill Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Property Transfer Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bank Debits Tax	0	0	0	0	0	0	0	0	11	9	10	9	9	12	11	11
Other Taxes	9	13	12	13	13	11	12	13	8	12	13	12	13	14	14	15
o/w Stamp Taxes	9	13	12	13	13	11	12	13	8	12	13	12	13	14	14	15
Tax Revenue	537	736	769	769	819	926	1,013	1,013	1,025	1,054	1,115	1,215	1,277	1,241	1,371	1,443

(Contd.)

Tax Revenue

Appendix 1 (Contd.)

(Rs. Million)

Tax Category	65/66	66/67	67/68	68/69	69/70	70/71	71/72	73	74	75	76	77	78	79	80	81
Tax on Income, Profit & Cap. Gains	281	312	321	349	445	447	453	704	606	770	935	937	1,102	1,357	2,086	2,029
Personal								246	190	258	253	287	384	386	378	570
Corporate								458	416	512	682	650	718	971	1,708	1,459
Domestic Taxes on Goods & Services	354	384	421	494	645	786	1,071	1,191	1,252	1,375	1,417	1,548	2,557	2,966	3,497	4,864
General Sales & TT	39	72	79	111	247	326	394	536	604	646	711	662	1,078	1,195	1,639	2,828
Manufacturing	39	72	79	111	247	326	394	457	495	531	569	451	834	665	1,051	1,727
Non-Manufacturing								79	109	115	142	211	244	530	588	1,101
Imports								-	-	-	-	-	-	-	-	-
Selective Sales (Excise)	137	154	185	237	226	265	336	368	589	665	642	832	1,374	1,684	1,776	1,941
Liquor								23	216	206	190		555	498	683	749
Tobacco								313	341	373	459	452		759	801	1,000
Other								0	0	-	-	-	60	385	93	69
Defence Levy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Licence Tax	40	38	31	18	47	45	53	50	59	64	64	54	74	87	81	95
Heavy Oil Motor Vehicle Tax	10	0	1	0	1	1	0	7	0	0	0	0	0	-	1	-
Surplus of Govt. Monopolies	118	107	110	110	124	149	287	230	0	-	-	-	31	-	-	-
Taxes on Specific Services	10	12	15	18	0	0	0	0	0	0	0	0	0	-	0	0
Betting/Lottery Tax	10	12	15	18	0	0	0	0	0	0	0	0	0	-	0	0
Taxes on International Trade	736	777	912	1,091	1,121	981	1,071	1,321	2,062	1,987	2,321	2,870	6,484	6,529	6,317	6,518
Import Duties	477	544	514	460	306	282	258	222	277	336	476	518	1,409	2,131	2,576	2,725
Export Duties	259	233	321	346	369	303	277	425	821	596	771	1,195	4,746	4,391	3,740	3,771
Foreign Exchange Taxes	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FEECs Revenue	-	-	77	285	446	396	536	674	964	1,055	1,074	1,157	329	7	1	22
Taxes on Property	24	22	23	28	30	55	62	86	81	102	100	118	142	62	56	71
Estate Duties	10	9	9	14	12	14	16	14	11	11	14	18	18	15	16	24
Wealth Tax / Gift Tax	12	13	13	13	17	25	27	41	37	54	45	50	45	37	28	37
Taxes on Financial & Cap. Trans.	2	0	1	1	1	16	19	31	33	37	41	50	79	10	12	10
Treasury Bill Tax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Property Transfer Tax	0	0	1	1	1	1	3	2	2	3	3	1	10	10	12	10
Bank Debits Tax	2	-	-	-	-	15	16	29	31	34	38	49	69	-	0	-
Other Taxes	16	19	20	21	21	21	25	20	19	25	26	36	68	101	201	211
o/w Stamp Taxes	16	19	20	21	21	21	25	20	19	25	26	36	68	101	201	211
Tax Revenue	1,412	1,515	1,697	1,983	2,262	2,290	2,682	3,323	4,020	4,259	4,799	5,509	10,354	11,015	12,158	13,694

(Contd.)

Appendix 1 (Contd.)

Tax Revenue															
(Rs. Million)															
Tax Category	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Tax on Income, Profit & Cap. Gains	2,923	3,366	5,480	5,586	4,787	4,909	4,647	5,148	7,337	9,722	10,967	12,543	15,277	17,161	20,751
Personal	808	891	1,760	1,424	1,513	1,580	1,464	2,207	2,957	3,539	4,067	5,235	5,621	7,358	7,315
Corporate	2,115	2,475	3,720	4,162	3,274	3,329	3,183	2,941	4,380	6,183	6,900	7,308	9,656	9,803	13,436
Domestic Taxes on Goods & Services	6,320	8,710	10,888	13,360	14,788	15,668	17,021	20,829	28,771	32,110	38,160	47,963	56,685	70,797	77,105
General Sales & TT	4,052	6,224	8,143	10,189	10,088	10,611	12,321	14,658	20,291	21,430	24,095	29,663	32,300	36,429	37,631
Manufacturing	1,806	2,718	3,045	3,619	3,270	3,675	3,610	4,496	6,798	7,945	8,262	9,231	9,171	9,906	8,874
Non-Manufacturing	1,524	1,891	1,928	2,739	2,415	2,426	3,386	3,004	3,726	2,974	3,546	4,825	6,445	7,074	9,711
Imports	722	1,615	3,170	3,831	4,403	4,510	5,325	7,158	9,767	10,511	12,287	15,607	16,684	19,449	19,046
Selective Sales (Excise)	2,123	2,298	2,549	2,982	4,414	4,716	4,420	5,812	8,170	10,597	10,232	11,655	14,632	19,436	22,067
Liquor	808	867	1,013	1,104	1,485	1,644	1,754	1,955	2,657	3,126	3,434	4,686	6,298	5,839	
Tobacco	1,315	1,431	1,536	1,877	2,927	3,071	2,665	3,855	5,461	6,884	3,339	6,866	7,888	8,788	12,833
Other	-	-	-	1	2	1	1	2	52	587	3,459	726	2,058	4,350	3,395
Defence Levy	-	-	-	-	-	-	-	-	-	-	3,763	6,589	9,693	14,408	16,441
Licence Tax	145	188	194	188	285	340	279	358	309	80	66	56	60	524	966
Heavy Oil Motor Vehicle Tax	0	0	0	0	0	0	-	-	0	-	-	-	-	-	-
Surplus of Govt. Monopolies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Taxes on Specific Services	0	0	2	1	1	1	1	1	1	3	4	-	-	-	-
Betting/Lottery Tax	0	0	2	1	1	1	1	1	1	3	4	-	-	-	-
Taxes on International Trade	5,172	7,439	13,081	10,998	11,050	12,975	12,501	16,495	19,341	19,752	21,641	20,819	22,598	24,373	25,464
Import Duties	2,538	4,047	6,670	8,093	9,414	11,051	10,671	14,923	16,792	18,617	20,819	20,762	22,598	24,365	25,459
Export Duties	2,634	3,392	6,411	2,905	1,636	1,924	1,830	1,572	2,549	1,135	822	57	-	8	5
Foreign Exchange Taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FEECs Revenue	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-
Taxes on Property	74	69	92	123	154	112	114	2,470	2,815	3,222	2,185	1,095	504	1,050	1,604
Estate Duties	22	17	23	41	34	25	19	10	17	13	15	-	-	-	-
Wealth Tax / Gift Tax	42	43	59	69	108	75	80	100	163	161	161	-	-	-	-
Taxes on Financial & Cap. Trans.	10	9	10	13	12	12	15	2,360	2,635	3,048	2,009	1,095	504	1,050	1,604
Treasury Bill Tax	-	-	-	-	-	-	-	2,345	2,618	3,033	1,991	1,073	471	1,050	1,604
Property Transfer Tax	10	9	10	13	12	12	15	15	17	15	18	22	33	-	-
Bank Debits Tax	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Taxes	247	326	397	375	492	1,454	1,663	2,571	2,942	3,351	3,400	3,452	4,363	5,150	5,279
o/w Stamp Taxes	247	326	397	375	492	1,454	1,663	2,351	2,942	3,271	3,400	3,452	4,363	5,150	5,279
Tax Revenue	14,736	19,911	29,938	30,442	31,271	35,118	35,946	47,513	61,206	68,157	76,353	85,872	99,427	118,531	130,203

Source: Central Bank of Sri Lanka Annual Reports and Ministry of Finance Estimates of Revenue and Expenditure

Appendix 2

Tax Discretionary Changes

	(Rs. Million)														
Tax Category	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
Income Tax	-2.5	5	16.5	0	23	0	0	20	8	0	0	45	81	10	0
Turnover Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
Excise Tax	0	0	0	0	9	0	0.2	0	0	0	0	17	0	10	6
Import Duty	0.5	-4	-5.5	0	17	-2	0	5.7	22	20	7.5	0	32	27	31
Total Tax Changes	-2	1	11	0	49	-2	0.2	25.7	30	20	24.5	45	123	73	77

Tax Category	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
Income Tax	-3.5	6	0	15	0	0	0	0	15	0	23	0	100	0	85
Turnover Tax	0	0	0	0	12	166	29	15	44	-25	0	0	0	0	0
Excise Tax	2	0	0	15	20	0	35	10	45	0	0	95	0	0	0
Import Duty	15	29	0	80	-15	0	60	0	0	0	0	-15	10	0	0
Total Tax Changes	13.5	35	0	110	17	166	124	25	104	-25	23	80	110	0	85

Tax Category	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
Income Tax															
Turnover Tax															
Excise Tax															
Import Duty															
Total Tax Changes															

Source : Ministry of Finance Budget Speeches

Adjusted Tax Revenue

(Rs. Million)

Year	Income Tax	Turnover Tax	Excise Tax	Import Tax	Total Tax Revenue
1950	999	—	—	5,350	9,517
1951	1,104	—	—	7,087	11,697
1952	1,552	—	—	7,681	12,044
1953	1,757	—	—	7,415	12,047
1954	1,460	—	248	6,696	12,022
1955	1,382	—	277	7,136	12,793
1956	2,046	—	330	7,911	13,716
1957	1,718	—	544	8,211	13,351
1958	1,628	—	801	7,336	12,908
1959	1,240	—	1,115	8,658	13,022
1960	1,133	—	744	9,394	13,075
1961	1,313	—	934	10,065	12,718
1962	984	—	1,030	9,951	11,553
1963	952	—	1,160	7,977	10,594
1964	994	517	1,244	9,019	10,881
1965	1,007	1,132	1,428	7,936	9,295
1966	932	1,261	1,554	8,205	8,953
1967	1,034	1,330	1,747	8,508	9,092
1968	1,005	1,459	1,926	6,802	9,464
1969	1,093	1,831	2,239	6,278	10,963
1970	1,436	1,280	1,948	4,176	11,439
1971	1,442	1,538	1,983	3,012	10,277
1972	1,462	1,794	2,458	2,756	11,941
1973	2,220	2,232	2,465	2,371	12,662
1974	1,911	2,626	3,943	2,959	15,425
1975	2,337	2,809	4,452	3,589	16,251
1976	2,838	3,091	3,722	5,237	18,091
1977	2,525	2,878	4,824	5,592	20,323
1978	2,610	4,062	7,794	2,489	23,271
1979	2,978	4,503	9,553	3,765	24,709
1980	4,578	5,786	9,649	4,551	27,555
1981	4,150	9,184	10,091	4,814	30,040
1982	5,576	8,672	8,410	4,764	29,156
1983	6,421	8,776	9,103	4,845	31,532
1984	10,404	10,665	9,362	7,943	46,021
1985	10,998	13,385	7,964	9,036	45,372
1986	8,639	12,914	10,468	10,216	45,056
1987	9,224	13,554	9,695	11,691	48,049
1988	9,109	15,776	7,392	10,865	48,022
1989	5,645	17,759	8,404	14,667	54,531
1990	7,187	23,292	10,523	16,370	66,917
1991	8,350	24,721	11,896	18,149	71,608
1992	10,147	28,080	11,058	20,528	78,856
1993	12,044	29,621	12,157	20,312	86,340
1994	15,277	32,300	14,632	22,598	99,427

Source: Author's Estimates.

Ratios of Actual to Estimated Tax																
Tax Category	49/50	50/51	51/52	52/53	53/54	54/55	55/56	56/57	57/58	58/59	59/60	60/61	61/62	62/63	63/64	
Tax on Income, Profit	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.9	0.9	1.0	1.2	0.9	0.9	1.1	
Domestic Taxes on Goods & Services	1.0	0.8	1.0	1.1	0.9	1.0	1.0	1.1	1.2	1.1	1.1	1.0	1.0	1.1	1.0	
General Sales & TT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Selective Sales (Excise)	1.1	1.2	1.0	1.2	1.1	1.1	1.0	1.5	1.4	1.2	1.0	1.1	1.0	1.2	1.0	
Defence Levy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Licence Tax	1.0	1.0	1.0	1.1	0.7	1.1	1.0	1.0	1.7	1.2	1.4	0.8	0.9	0.9	1.1	
Motor Vehicle Taxes	1.0	1.7	1.8	2.2	1.0	1.0	1.0	1.3	0.8	0.8	0.4	1.0	1.1	1.1	0.8	
Surplus of Govt. Monopolies	0.9	0.7	1.0	1.1	1.0	0.9	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.1	
Taxes on Specific Services	1.0	1.3	1.3	0.8	1.7	1.0	0.9	0.8	0.6	0.7	0.8	0.9	0.7	1.2	1.0	
Lottery Tax	1.0	1.3	1.3	0.8	1.7	1.0	0.9	0.8	0.6	0.7	0.8	0.9	0.7	1.2	1.0	
Taxes on International Trade	1.1	1.0	1.0	1.1	1.1	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.1	0.9	1.0	
Import Duties	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.1	1.0	1.0	1.1	0.9	1.0	
Export Duties	1.1	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	0.9	0.9	
FEECs Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Taxes on Property	1.0	1.0	2.0	1.3	1.2	1.4	0.9	0.4	0.8	0.8	1.1	0.8	0.9	1.1	0.9	
Estate Duties	1.0	1.0	2.0	1.3	1.2	1.4	0.9	0.4	0.7	1.0	1.1	1.0	1.3	1.1	1.1	
Wealth Tax / Gift Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.9	1.0	0.7	
Taxes on Financial & Cap. Trans.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.8	1.0	0.6	0.8	1.1	1.1	
Treasury Bill Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Property Transfer Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other Taxes	1.1	1.4	1.1	1.2	1.0	1.0	1.1	1.1	0.5	0.8	1.1	1.0	1.1	1.2	1.2	
Stamp Taxes	1.1	1.4	1.1	1.2	1.0	1.0	1.1	1.1	0.5	0.8	1.1	1.0	1.1	1.2	1.2	
Total Taxes	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	

(Contd.)

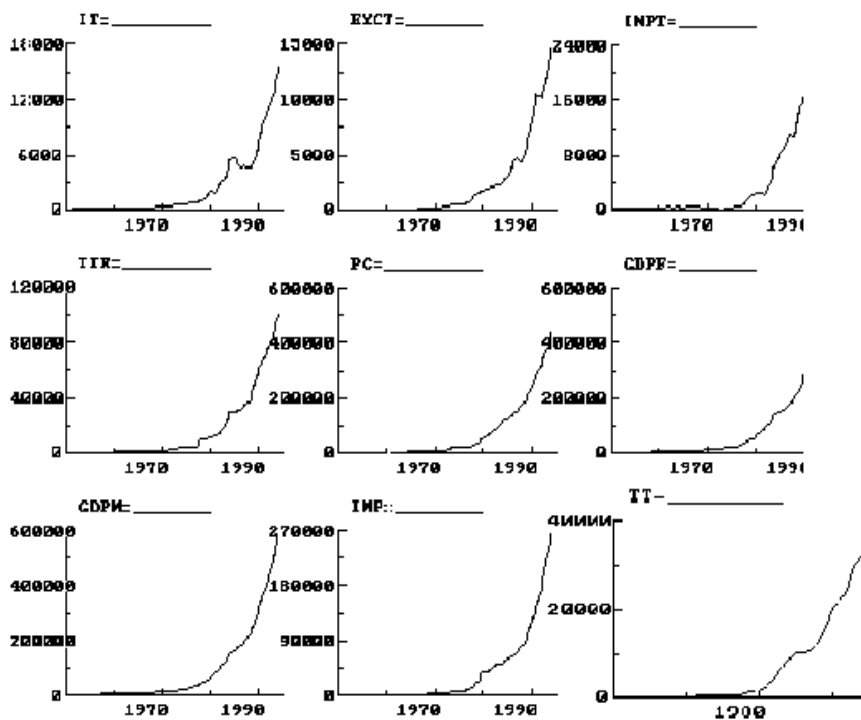
Ratios of Actual to Estimated Tax															
Tax Category	64/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	73	74	75	76	77	78	79
Tax on Income, Profit	1.1	1.1	1.2	1.2	1.0	1.0	1.0	0.7	1.1	1.1	1.3	1.1	1.1	1.0	1.2
Domestic Taxes on Goods & Services	1.1	1.1	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	0.9	1.0	1.0	1.0
General Sales & TT	1.0	1.1	1.0	1.1	1.0	1.0	1.0	0.9	1.0	1.1	1.0	1.0	1.0	1.0	0.9
Selective Sales (Excise)	1.0	1.0	1.0	1.0	1.1	1.0	1.0	0.8	1.1	1.0	1.0	0.9	1.0	1.0	1.1
Defence Levy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Licence Tax	1.0	1.0	1.1	0.9	0.4	1.2	1.0	0.9	0.8	1.0	1.0	1.1	0.9	1.3	0.9
Motor Vehicle Taxes	0.9	2.0	1.5	1.7	0.1	2.5	4.5	0.0	1.0	0.0	2.7	2.7	0.2	1.0	0.0
Surplus of Govt. Monopolies	1.1	1.1	1.0	1.0	1.0	1.0	1.0	0.9	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Taxes on Specific Services	29.5	0.9	24.8	1.1	1.0	0.0	5.0	3.8	1.0	0.7	1.4	1.6	1.1	0.9	0.0
Lottery Tax	29.5	0.9	24.8	1.1	1.0	0.0	5.0	3.8	1.0	0.7	1.4	1.6	1.1	0.9	0.0
Taxes on International Trade	0.9	0.9	1.1	1.1	1.0	1.0	1.0	0.8	0.9	1.1	1.0	1.1	1.1	1.0	1.0
Import Duties	0.8	0.9	1.1	1.0	1.0	1.0	1.0	0.8	0.9	1.3	1.1	1.0	1.0	1.0	1.1
Export Duties	1.1	0.9	1.0	1.0	1.1	1.0	1.0	0.8	1.1	1.0	1.1	1.3	1.7	1.0	1.0
FEECs Revenue	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Taxes on Property	1.0	0.9	0.9	1.0	1.2	1.1	1.0	0.9	1.3	1.3	1.3	1.1	0.8	1.2	0.9
Estate Duties	0.8	1.1	1.0	1.0	1.6	0.8	1.1	1.1	1.2	0.9	0.9	1.2	1.1	0.9	0.8
Wealth Tax / Gift Tax	1.1	0.6	0.8	1.0	1.0	1.4	1.0	1.0	1.5	2.0	1.6	1.1	0.5	1.1	1.1
Taxes on Financial & Cap. Trans.	1.0	29.6	1.4	1.2	1.0	0.9	0.9	0.7	1.1	1.1	1.1	1.1	1.4	1.4	0.5
Treasury Bill Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Property Transfer Tax	0.7	3.9	1.4	1.2	1.0	0.9	1.4	1.5	0.9	1.0	1.5	1.5	0.3	1.7	0.5
Other Taxes	0.9	0.9	1.1	1.3	1.1	1.1	0.9	1.0	0.8	0.8	1.0	1.0	1.4	1.9	1.3
Stamp Taxes	0.9	0.9	1.1	1.3	1.1	1.1	0.9	1.0	0.8	0.8	1.0	1.0	1.4	1.9	1.3
Total Taxes	1.0	1.0	1.1	1.1	1.0	1.0	1.0	0.8	1.0	1.1	1.0	1.0	1.1	1.0	1.0

(Contd.)

Tax Category	Ratios of Actual to Estimated Tax														
	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
Tax on Income, Profit	1.8	0.9	1.0	1.0	1.2	1.0	1.0	1.0	1.0	0.9	1.1	1.2	1.1	0.9	1.0
Domestic Taxes on Goods & Services	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0
General Sales & TT	1.2	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	0.9
Selective Sales (Excise)	1.0	1.0	1.0	1.0	1.0	0.9	1.1	1.0	1.0	1.0	1.0	1.0	0.8	0.9	1.1
Defence Levy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.0	1.1
Licence Tax	0.9	0.8	0.6	1.0	1.0	1.0	1.2	1.2	0.9	1.0	0.8	2.5	2.0	1.5	1.2
Motor Vehicle Taxes	80.0	0.0	1.0	1.3	1.0	1.7	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surplus of Govt. Monopolies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taxes on Specific Services	3.0	1.1	1.3	3.1	10.1	1.0	1.0	1.0	0.5	1.0	1.4	0.0	0.0	0.0	0.0
Lottery Tax	3.0	1.1	1.3	3.1	10.1	1.0	1.0	1.0	0.5	1.0	1.4	0.0	0.0	0.0	0.0
Taxes on International Trade	1.0	1.0	0.9	1.0	1.1	1.1	1.0	1.0	0.9	1.0	1.1	1.0	1.0	0.8	0.8
Import Duties	1.2	0.9	0.8	0.9	1.2	1.1	0.9	1.0	0.9	1.0	1.0	1.0	1.0	0.8	0.8
Export Duties	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	0.9	1.1	0.8	1.0	1.8	0.0
FEECs Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taxes on Property	0.8	1.2	1.3	0.8	1.2	1.9	2.2	1.3	1.3	1.0	0.9	1.0	1.2	0.8	0.9
Estate Duties	0.8	1.6	1.4	0.8	1.2	2.4	1.5	1.7	1.0	1.0	1.1	1.3	1.5	0.0	0.0
Wealth Tax / Gift Tax	0.9	1.1	1.3	0.8	1.3	1.8	3.0	1.3	1.5	1.6	1.6	1.5	10.7	0.0	0.0
Taxes on Financial & Cap. Trans.	0.8	0.9	0.9	1.0	1.0	1.3	1.0	1.0	1.1	1.0	0.9	1.0	1.1	0.8	0.9
Treasury Bill Tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.9	1.0	1.1	0.7	0.9
Property Transfer Tax	0.8	0.9	0.9	1.0	1.0	1.3	1.0	1.0	1.1	1.1	1.1	0.9	0.0	0.0	0.0
Other Taxes	2.2	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.0	1.2	1.2	1.2	1.1	1.0	1.0
Stamp Taxes	2.2	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.0	1.1	1.2	1.1	1.1	1.0	1.0
Total Taxes	1.1	1.0	0.9	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9

Source : Central Bank of Sri Lanka Annual Reports and Ministry of Finance Estimates of Revenue and Expenditure

Time Plots for Variables in Elasticity Estimation



Source: Author's Estimates.